

1% or 30% CO2 + Temperature & %RH

Diffusion Data Loggers



Models Covered

| | |
|-----------|---------|
| CM-0016 | CM-0209 |
| CM-0017 | CM-0210 |
| CM-0018 | CM-0212 |
| CM-0-18AA | CM-0213 |
| CM-0019 | |

Save For Future Reference

Your Model: _____

Serial Number: _____

Purchase Date: _____

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Welcome

Thank you for purchasing our meter. CO2Meter, Inc. is a Florida based business specializing in the design and manufacturing of gas detection and monitoring devices – mainly CO2. Our approach is one based in the science of gas and how best to accurately and repeatedly measure that gas for the end users purposes. Our business partners in agriculture, HVAC, science, safety, research, pharmaceuticals, beverage, and other fields find our devices to be highly accurate and cost effective.

We approach each customer's application as a unique opportunity to understand, educate, and provide product solutions that meet the customers' needs while exceeding their expectations for reliability and service. Our continued product innovation in combination with our "customer first" focus allows CO2Meter, Inc. to continue to provide solutions for the future.

Based in Ormond Beach, FL, CO2Meter, Inc. is committed to the success of our customers; the health, welfare, and prosperity of our talented employees; and the continued development of our local community.

CO2Meter, Inc. appreciates your business and looks forward to working with you and your team in the future.

Please take some time to read through this manual in order to become familiar with your meter. Pay special attention to the important safeguards below.

Important Safeguards

To reduce the risk of fire, electrical shock and/or injury, basic safety precautions should always be followed when using electrical appliances, including the following:

1. **READ ALL INSTRUCTIONS BEFORE USING THIS METER.**
2. **INSTALL GasLab® SOFTWARE BEFORE CONNECTING METER TO A COMPUTER.**
3. Charge rechargeable meters for at least 5-8 hours before use.
4. The rechargeable data loggers contain a lithium polymer (Li-Ion) battery. Do not expose to extreme heat or cold.
5. The Li-Ion battery is not user-replaceable. Please do not attempt to open the meter and replace the battery.
6. Do not use rechargeable AA batteries.
7. For models using AA batteries, do not store the meter with the AA Alkaline batteries installed to prevent the potential for battery leakage.
8. Use only the supplied 5/6VDC international wall power supply adapter. Precisely 5/6V must be applied to the meter. Other voltages can cause permanent damage.
9. The meter is not designed for outdoor use.
10. Do not allow the meter to be exposed to water.
11. Do not operate the meter with the enclosure opened.
12. Do not operate the meter if it is malfunctioning.
13. Use of this device in environments above 95% humidity may cause irreparable damage to the components.

SAVE THESE INSTRUCTIONS

Product Overview

This CO2Meter, Inc. data logger is designed to measure carbon dioxide (CO₂), percent of relative humidity (%RH), and temperature through diffusion sampling. It stores collected data to its internal memory to be retrieved at a later time for analysis. When combined with our GasLab® software, you can also see real-time data on your computer's screen.

Scientific devices such as this data logger require the user to have an intimate knowledge of the meter, its operation, the required software, and the meter specifications prior to use. CO2Meter, Inc. highly recommends reading this user's manual before operating the device, especially the *Important Safeguards* section above.

Theory of Operation

The CO₂ sensor inside this meter uses NDIR (non-dispersive infrared) technology to sense, as a function of transmitted light, the concentration of CO₂ in the air. It has been factory calibrated to operate within the specified range and precision.

Package Contents

Verify that your package contains the following items before using the meter:

All meters:

- (1) Meter
- (1) 5/6VDC international power supply
- (1) 6-foot USB Cable
- (1) Calibration Certificate Tag
- (1) User's Manual



CM-0016 or CM-0017



**CM-0018, CM-0018AA,
CM-0019, CM-0209, CM-0210
CM-0212, CM-0213**

Optional Accessories

A Hydrophobic Vent Filter Kit may be purchased separately. These filters are ideal for high-humidity environments to allow air flow while keeping humidity out. Long-lasting, use anywhere humidity is very high (> 95%). Order part number CM-0172.

Powering the Meter

All data loggers come with an international power adapter and are battery-powered. Some meters are powered by an internal rechargeable Li-Ion battery and others by dry cell non-rechargeable alkaline AA batteries (not included), depending on the model of the meter. The table below shows detailed information about the battery used by each available model.

| Model No. | Configuration | LCD | Battery Type | Capacity(mAh) |
|-----------|----------------|-----|---------------------|---------------|
| CM-0016 | 1% CO2 + RH/T | Yes | 4 Dry AA Cell* | 1,800-2,600 |
| CM-0017 | 30% CO2 + RH/T | Yes | 4 Dry AA Cell* | 1,800-2,600 |
| CM-0018AA | 1% CO2 + RH/T | No | 4 Dry AA Cell* | 1,800-2,600 |
| CM-0018 | 1% CO2 + RH/T | No | Rechargeable Li-Ion | 2,200 |
| CM-0019 | 30% CO2 + RH/T | No | Rechargeable Li-Ion | 2,200 |
| CM-0209* | 30% CO2 + RH/T | No | Rechargeable Li-Ion | 6,000 |
| CM-0210* | 1% CO2 + RH/T | No | Rechargeable Li-Ion | 6,000 |
| CM-0212 | 1% CO2 + RH/T | No | Rechargeable Li-Ion | 3,600 |
| CM-0213 | 30% CO2 + RH/T | No | Rechargeable Li-Ion | 3,600 |

** Discontinued Models*

IMPORTANT: METERS USING DRY AA CELLS: USE NON-RECHARGEABLE ALKALINE BATTERIES ONLY. DO NOT STORE THE METER WITH THE BATTERIES INSTALLED TO PREVENT THE POTENTIAL FOR BATTERY LEAKAGE.

Battery Life

Data loggers using AA dry cell alkaline batteries can run continuously for up to 8 hours, regardless of logging interval selected.

The battery life for data loggers using a rechargeable Li-Ion battery depends on the selected logging interval. The table below shows the estimated battery life (EBL) based on some typical logging intervals.

| Logging Interval (T) | Avg. Draw (D) | Est. Battery Life (EBL) 2,200mAh | Est. Battery Life (EBL) 3,600mAh | Time to Fill Memory (TTFM) |
|----------------------|---------------|----------------------------------|----------------------------------|----------------------------|
| 30 sec. | 33.9 mA | 65 hrs. | 104 hrs. | 500 hrs. |
| 1 min. | 17.3 mA | 127 hrs. | 203 hrs. | 1,000 hrs. |
| 5 min. | 4.0 mA | 550 hrs. | 880 hrs. | 5,000 hrs. |
| 10 min. | 2.2 mA | 1,005 hrs. | 1,680 hrs. | 10,000 hrs. |
| 30 min. | 1.3 mA | 1,754 hrs. | 2,806 hrs. | 30,000 hrs. |
| 1 hour. | < 1 mA | 2,251 hrs. | 3,600 hrs. | 60,000 hrs. |

As shown in the table above, while the unit continuously draws power, the average draw over time is lower as the logging interval increases. For example, if data is logged once an hour, the estimated battery life for a 2,200mAh unit is 2,251 hours, or approximately 90 days assuming the battery was initially fully charged.

NOTE: The AA battery-powered Meter (CM-0018AA) will have an estimated battery life similar to that of the 2,200mAh Li-Ion battery-powered model (CM-0018).

Calculating Li-Ion Battery Life

In operation, the Li-Ion powered data loggers draw less than 0.7 mA continuously and ~400 mA for 2.5 seconds during each measurement. This allows us to calculate the approximate battery life (endurance in the field) for any desired logging interval:

$$\text{AVERAGE DRAW (mA)} = \frac{0.7 (T-2.5) + 1,000}{T}$$

Where T = the measurement interval in seconds. The .7 (T-2.5) gives us the current total current draw for one cycle of standby because we draw .7 mA for the entire interval except the 2.5 seconds of actual measurement. Then we add the measurement cycle during draw of ~400 mA for 2.5s (2.5 * 400 = 1,000). And finally we divide by T to get the overall average draw.

For example, the average draw for a 30 second interval:

$$\text{AVERAGE DRAW (mA)} = \frac{0.7 (30-2.5) + 1,000}{30} = 33.9 \text{ mA}$$

To get the Estimated Battery Life (EBL), we divide the battery capacity by the average draw. In the case of a 2,200mAh battery, this would be:

$$\text{ESTIMATED BATTERY LIFE} = 2,200\text{MAH} / 33.9\text{MA} = 64.9 \text{ HOURS}$$

Calculating Time to Fill Memory

All meters can store up to 60,000 data logs. A data log is defined as:

- Data/Time
- CO2 level
- Temperature
- %RH

To determine the Time to Fill Memory (TTFM) use the following formula:

$$\text{TIME TO FILL MEMORY (TTFM)} = \text{NUMBER OF LOGS AVAILABLE} / \text{LOGS PER HOUR}$$

For example, if you were to log data once every minute,

$$60,000 / 60 = 1,000 \text{ HOURS}$$

Note that at every logging interval, the batteries will be exhausted before the memory is filled.

Once the memory is full, the meter will continue to log new data over the original data beginning at the first data point. Therefore, after each logging session you should use Gaslab® to save your data.

IMPORTANT: DOWNLOAD THE DATA LOGS REGULARLY TO PREVENT POSSIBLE DATA LOSS. ONCE THE MEMORY IS FULL, PREVIOUSLY LOGGED DATA WILL BE OVERWRITTEN.

Charging the Meter

Meters powered by rechargeable Li-Ion batteries can be charged using the supplied universal power adapter or a USB port on a powered computer. Li-Ion batteries will be fully charge in 5-8 hours and will lose about 8% of their charging capacity per every year of use at 25°C.

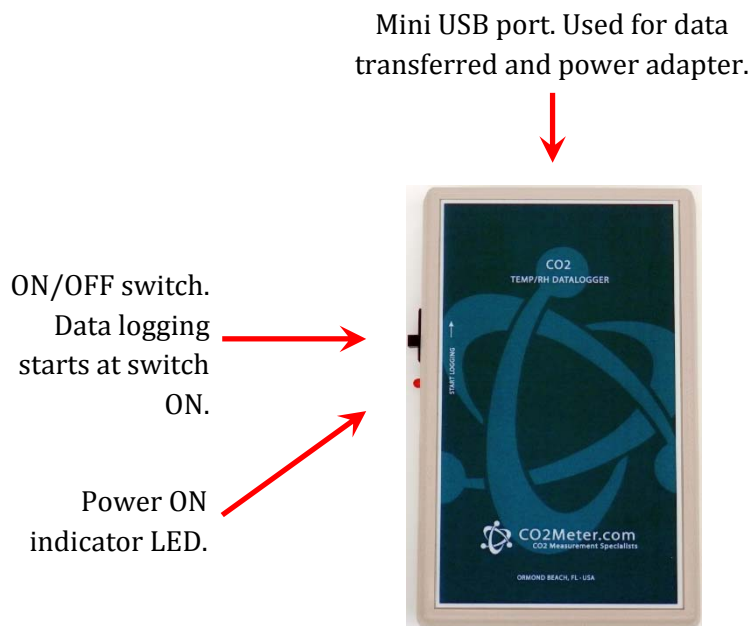


Figure 1: Data logger models without display

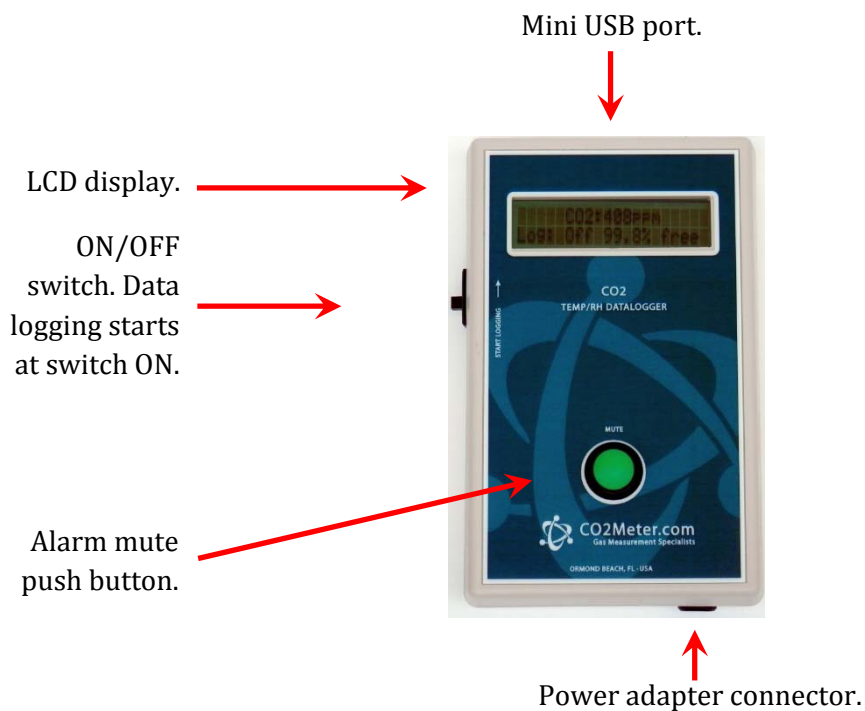


Figure 1: Data logger models with display

Software

Our meters use GasLab® software, a free tool that lets you configure your meter, download data logs and more.

Capabilities

- Configure Meter
- Manage and download logs
- Adjust logging intervals
- Calibrate the meter
- Automatic data logging when meter is powered ON
- Collect data in real-time and view on screen

Minimum System Requirements

To utilize the software, your PC must meet the following minimum requirements:

- 1GHz processor with 1GB RAM, 1GB free disk space (2GB free disk space for 64-bit systems).
- Windows XP*/7/8/8.1 with Microsoft .NET Framework 4.0** or later.
- On Intel-based Mac computers, GasLab® software can run using a Windows 7/8 virtual machine software such as *VMware Fusion®* or similar.

*Microsoft .NET is not supported on Media Center or Tablet editions.

**Installer will optionally install .NET Framework.

Installation

Go to <http://www.co2meter.com/pages/downloads> to download our free GasLab® software for Windows.

IMPORTANT: YOU MUST INSTALL SOFTWARE BEFORE CONNECTING THE METER TO YOUR COMPUTER.

To install the GasLab® software, follow the steps and instructions prompted by your computer's operating system. Make sure you have administrator privileges in order to install this program.

After the software is installed, plug in the meter with the included USB cable. Your operating system will automatically install the proper USB drivers necessary for the meter to “talk” to your PC.

We strongly recommend allowing GasLab® to install drivers for the meter automatically.

Read the GasLab® manual <http://co2meters.com/Documentation/Manuals/Manual-GasLab.pdf> carefully to become more familiar with how the software works so that you can get the maximum benefit from your meter.



Operation Guide

Make sure you read through these instructions thoroughly before using the meter. This guide will help you become more familiar with the meter in order to be as productive as possible in a short period of time. Please read the Important Safeguards on page 3 before continuing.

IMPORTANT: Follow these instructions to ensure proper set up:

1. Download and install the GasLab® Software to your computer.
2. Power the meter using batteries or the included international power adapter.
NOTE: connecting the included USB cable to a port in a computer will not supply the appropriate power.
3. Turn *ON* the meter.
4. If the meter has a LCD display wait until the display changes colors to visually confirm it has reset successfully after connecting it to a USB port on a computer.

Connecting the Meter

The first time the meter is connected to your computer, the operating system will install the necessary USB drivers as shown in *Figure 2*. This process could take a few minutes.

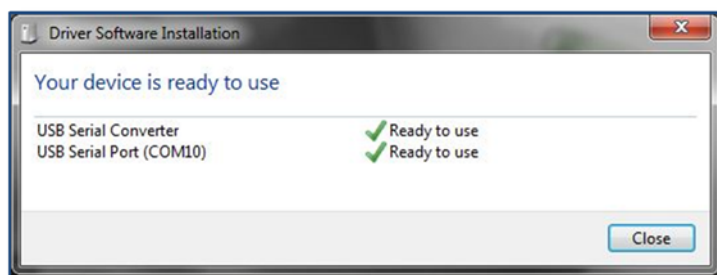


Figure 2: USB Driver Installation.

Setting the Meter

1. Ensure the data logging switch is in the ON position.
2. Connect the meter to the computer using the included USB cable.
3. Launch the GasLab® software.
4. Connect the meter/sensor to your computer

NOTE: The meter must be started at least 1 minute prior to use and data logging to allow the CO2 sensor enough time to warm-up and calibrate.

After connecting the meter to a computer and setting it, the GasLab® software will allow you to perform the following main functions:

- **Collect Real-time** – data being recorded is displayed on graph.
- **Manage and Download Logs** – provide options to manage data logs saved in the meter.
- **Configure Sensor** – provide options to setup the sensor inside the meter and data logging options, among other features.

NOTE: A separate data file will be created each time the meter is powered ON (starts logging).

Logging Data

Once the GasLab® software has been installed and the meter is connected to the computer, you can gather data in a variety of ways. Depending on the type of meter, data can be collected in real time, data logs can be downloaded from the meter's memory (if equipped), and saved to the computer, and data can be reviewed on the meter's LCD display (if equipped).

For each logging session

1. Turn the meter ON.
2. The meter must be started at least 1 minute prior to deployment and data logging to allow the CO2 sensor time to warm-up and calibrate.
3. Set the logging interval (min 30 sec) as desired and commence logging.
4. When data logging is completed, turn the meter OFF.

Setting the Logging Interval

To change the default settings, connect the meter to a computer using the included USB cable. Select the desired meter, and change the settings.

NOTE: Refer to the GasLab® User's Manual for complete instructions.

Display and Alarm (CM-0016, CM-0017 only)

This data logging meter includes a built-in audible (80dB) alarm and an LCD (Liquid Crystal Display) display that provides visual indication of the current CO2 level by changing color to green, yellow or red, depending on CO2 level ranges selected. The display will change colors depending on the actual CO2 level readings by setting the "Green", "Yellow", and "Red" ranges.

The alarm is set per LEED IAQ levels by default but can be programmed to other standards such as OSHA levels using the GasLab® software. The new alarm level will be maintained in the meter's memory.

During operation, when the meter is turned on, and when the high concentration CO2 level programmed is reached, an 80dB alarm will sound. The alarm can be muted for 30 seconds by pressing the button on the front of the meter. This feature can be changed in GasLab®.

Calibration

The CO2 sensor, in IAQ applications only, uses an algorithm called Automatic Background Calibration (ABC) to ensure maximum accuracy by continuously adjusting the zero-point.

The ABC algorithm allows the CO2 sensor to dynamically shift its CO2 reading by a constant. It works via storing the lowest CO2 sample taken over the ABC Period and assuming that this low value is equal to a known value (the target value). It then adjusts the output of the CO2 reading by the delta between these values. This algorithm does not affect the linearization of the output signal. For example, by default ABC is enabled with an ABC Period of 180 hours, a target value of 400ppm, and a maximum delta of 30ppm. This operates under the principle that ambient, outdoor air is at 400ppm.

The sensor will keep track of the lowest CO₂ reading recorded over a period of 180 hours and then adjust the zero point, up to 30ppm at a time, towards that value.

To ensure maximum accuracy it is recommended to install the device in an environment that will routinely see this low value.

In addition, this meter can be exposed to fresh air for a few minutes between uses to verify calibration by making sure the readings are close to 400 ppm, or can be manually calibrated using the GasLab® software.

NOTE: Refer to the GasLab® User's Manual for complete instructions.

Meter Specifications

| | | |
|----------------------------------|-----|--|
| Measuring Principle: | CO2 | Non-dispersive infrared (NDIR) sensor |
| Measuring Range: | | |
| 1% CO2 models | | 0-10,000 ppm |
| 30% CO2 models | | 0-300,000 ppm (0-30% vol.) |
| Repeatability: | | |
| 1% CO2 models | | ±20 ppm, ±1% measured value |
| 30% CO2 models | | ±0.1%, ±2% of measured value |
| Accuracy: | | |
| 1% CO2 models | | ±30ppm, ±3% measured value |
| 30% CO2 models | | ±0.2%, ±3% of measured value |
| CO2 Sensor Ratings: | | |
| Life Expectancy | | >15 years |
| Warm-up Time | | <1 min (instant measurements) |
| Temperature Sensor: | | |
| Range | | -40 to 120°C |
| Repeatability | | ±0.1°C |
| Accuracy | | ±0.5°C |
| Relative Humidity Sensor: | | |
| Range | | 0-100% |
| Repeatability | | ±0.1% |
| Accuracy | | ±3% |
| Dimensions: | | (mm) inches |
| L x W x D | | (146.1)5.75 x (91.4)3.60 x (32.7)1.30 |
| Data Logging: | | |
| Data Points | | 60,000 in internal memory |
| Programmable Interval Data | | Date, Time, CO2, %RH, Temp. |
| Power: | | |
| Input Voltage | | 5VDC (use only supplied adapter) |
| Power Consumption | | 500 mA (while charging) |
| Charging Time | | 5-8 hrs. (approximately) |
| Battery Type/Capacity | | 4xAA (CM-0016,-0017,-0018AA) Li-Ion/2,200mA (CM-0018,-0019) Li-Ion/6,000mA (CM-0209,-0210) Li-Ion/3,600mA (CM-0212,-0213) |
| Li-Ion Battery Lifetime | | 2-3 years depending on cycles |

Troubleshooting Guide

| Symptom / Issue | Possible Cause | Resolution |
|---|---|---|
| Meter is not recognized by computer | No power. | Replace/recharge the batteries or connect meter to the included power supply and power meter ON. |
| Meter is not recognized by computer | Unable to find correct COM port for USB. | Read this App note on reassigning COM ports for USB: http://www.co2meters.com/Documentation/AppNotes/AN134-Change-COM-Ports.pdf |
| All log time stamps start in the year 2000 | The real-time clock was not synced. | Connect the meter to the computer with data logging off. The time will synchronize in GasLab®. |
| No logs are present on the meter after data logging | Meter was disconnected while logs were being downloaded. | Connect the meter to the computer and download logs again. |
| The display is Blue or shows Sensor Missing | The meter's EEPROM is corrupted, or battery/power supply issues. | Email technical support for further assistance. |
| CO2 Readings are inaccurate | ABC is adjusting the zero point. | Turn off ABC in software or ensure the unit is exposed to 400ppm air while data logging. |
| | Batteries are low. | Replace/recharge batteries. |
| | The meter was disturbed mechanically. Meter may need calibration. | Perform a calibration or send to CO2Meter for professional calibration and recertification. |

Support

The quickest way to obtain technical support is via email. Please send all support inquiries to support@co2meter.com.

Please include a clear, concise definition of the problem and any relevant troubleshooting information or steps taken so far, so we can duplicate the problem and quickly respond to your inquiry.

Warranty

This meter comes with a 1YEAR (warranty period) limited manufacturer's warranty, starting from the date the meter was shipped to the buyer.

During this period of time, CO2Meter.com warrants our products to be free from defects in materials and workmanship when used for their intended purpose and agrees to fix or replace (at our discretion) any part or product that fails under normal use. To take advantage of this warranty, the product must be returned to CO2Meter.com at your expense. If, after examination, we determine the product is defective, we will repair or replace it at no additional cost to you.

This warranty does not cover any products that have been subjected to misuse, neglect, accident, modifications or repairs by you or by a third party. No employee or reseller of CO2Meter.com's products may alter this warranty verbally or in writing.

Use of this device in environments above 95% humidity may cause irreparable damage to the components and is not warranted.

Liability

All liability under this agreement shall be limited to the actual cost of the product paid to CO2Meter.com. In no event shall CO2Meter.com be liable for any incidental or consequential damages, lost profits, loss of time, lost sales or loss or damage to data, injury to person or personal property or any other indirect damages as the result of use of our products.

Returns

If the product fails under normal use during the warranty period, a RMA (Return Material Authorization) number must be obtained from CO2Meter.com. After the item is received CO2Meter.com will repair or replace the item at our discretion.

To obtain a RMA number, call us at or email us at (386) 256-4910 support@co2meter.com. When requesting a RMA please provide reason for return and original order number.

If the product fails under normal use in the first 10 days of ownership, at our discretion we will email you a postage-paid UPS label to return the product at our expense.


If we determine that the product failed because of improper use (water damage, dropping, tampering, electrical damage etc.), or if it is beyond the warranty date, we will inform you of the cost to fix or replace the product.


Contact Us

We are here to help!

For information or technical support, please contact us.

 support@CO2Meter.com

 (386) 256-4910 (Technical Support)

 (386) 872-7665 (Sales)

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